AN AMERICAN fisherman

ESTABLISHED 1947

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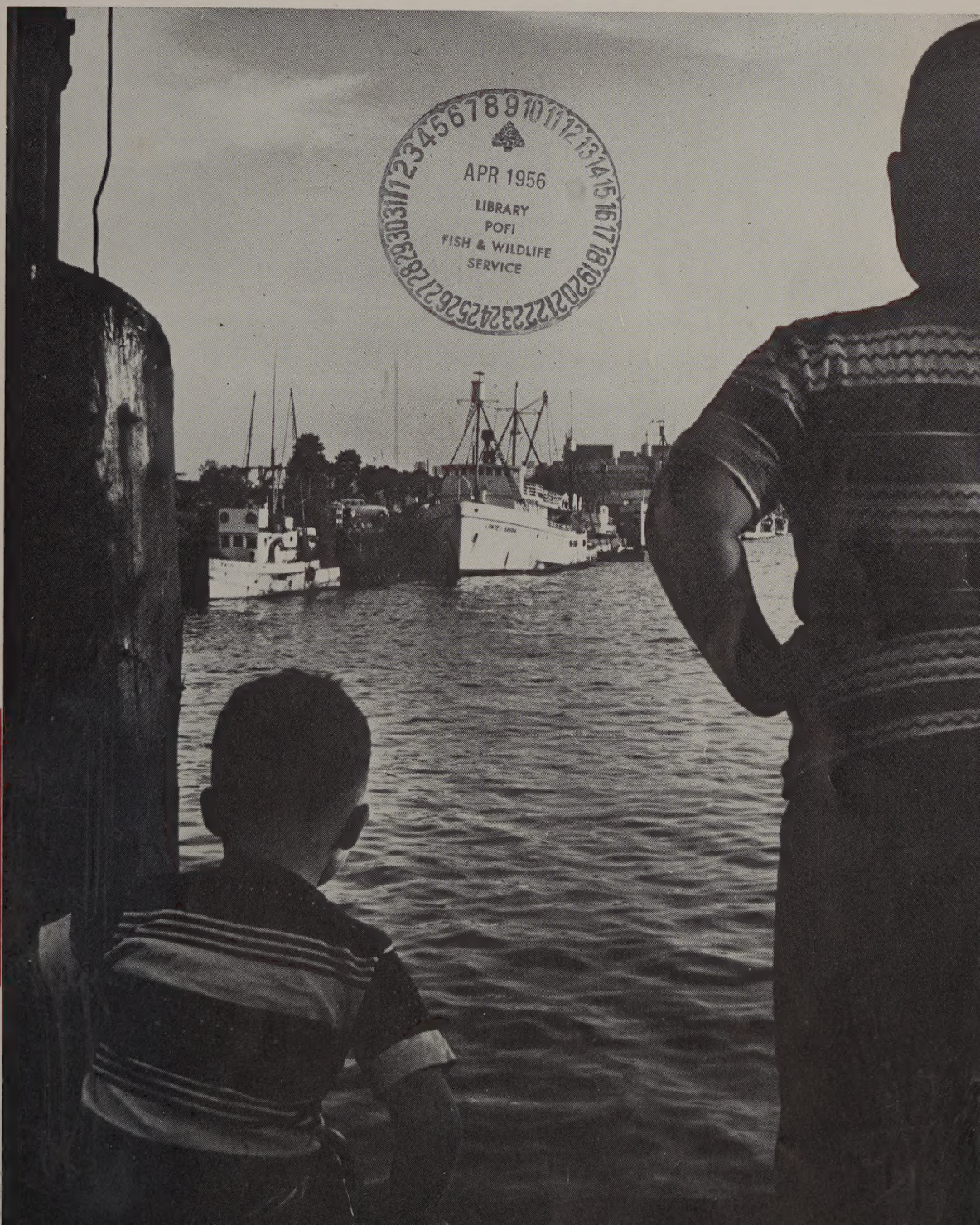

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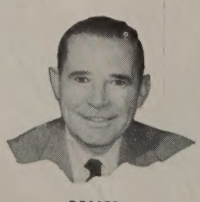
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Fisheries Advisory Committee To Meet in May

The third meeting of the American Fisheries Advisory Committee, authorized under the Saltonstall-Kennedy Act, will be held on May 1 and 2 in Long Beach, Calif., according to an announcement by Assistant Secretary of the Interior Wesley A. O'Ewart who will serve as presiding officer.

The chief objective of the meeting will be to review the status of current fishery research and development projects being financed by Saltonstall-Kennedy funds and to discuss recommendations for next year's program. The program is now in the second year of operation.

The Act authorizes funds to provide an educational service and market development program, and to conduct research. The Secretary of the Interior was authorized to appoint a group of experts from the different segments of the industry—fishermen, vessel owners, distributors, and processors of fish and fishery products and byproducts—to advise him on commercial fishing problems. The committee consists of 19 members, appointed to serve until June 30, 1957.

Two meetings were held in 1955, the first in Washington, D. C., in April, and the second in Boston in August. A different city is selected for each meeting in order to give committee members the opportunity to study at first hand new developments in important fishery areas of the country. While in the Long Beach-San Pedro area, the group will inspect local fishery activities.

Fishing Possibilities in Australian Waters

Jason Gurney, a food technologist representing a group of South African fishing companies, recently visited Australia to investigate the possible extension to Australia of South African fishing interests.

Mr. Gurney said he found that South Australia had ideal conditions for a major fishing industry but at least $5,000,000 would be needed to develop it. He offered the opinion that South Australia could develop its fishing industry to the same extent as South Africa, where the value of the annual output had risen from $2,250,000 to $120,000,000 in seven years. Among points favoring a fishing industry in South Australia were:

1. Large areas of sheltered water and safe anchorage for fishing.
2. Ideal ports for the setting up of fisheries.
3. The great variety of fish suitable for canning and reduction for oil and fish meal.

Mr. Gurney suggested fishing crews would probably have to be imported to start a big industry. South Australian fishermen are mainly "longshoremen," who work with small privately owned gear and without the range or capacity to produce enough fish for a canning industry. The Chief Inspector of the South Australian Fisheries and Game Department (F. W. Moorhouse) said that to operate on a profitable basis for a factory market, a fleet of at least 20 trawlers and dozens of purse seine and lampara net boats (for small fish) would be needed.

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About This Issue . . .

SOUTHERN California members of the present Congress are among the hardest working men in efforts to get some new fisheries legislation passed in this session . . . Senator Kuechel and Representatives Wilson and Utt. You can read more about their activities in "Report from Washington" on page 7.

*

There's little doubt about some of the proposed measures being all to the good . . . but there is doubt in the industry itself regarding some of the provisions. For example, what about setting up a new Fisheries Commission instead of the present Fish & Wildlife Branch of the Interior Department? Would it help or would it just add more politics to the situation? We invite comments.

*

From that well known expert on Pacific oceanic matters, Dr. A. L. Tester, we are happy to present an article and graphs on "Recent Equatorial Tuna Research" on pages 10 and 11. It brings out some interesting points about the life and habits of tuna. Somehow reminds us of the present Bridey Murphy craze.

*

You'll also be interested in "Fishing Boat Design" on page 9, and "A Study of Yellowtail" on page 14.

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Jack Mackerel Survey

In August 1955 oceanographic research vessels from the west coast of the United States and Canada, the Hawaiian Islands and Japan participated in the "NORPAC" expedition, a coordinated collecting expedition over the northern Pacific ocean. While some time may elapse before data collected on this expedition are completely analyzed, some interesting results are available.

Fish and Wildlife Service biologists state that as a result of the NORPAC expedition knowledge of the range of jack mackerel has been greatly extended. This fish is of considerable commercial importance in California. Eggs and larvae collected on this expedition indicate the species spawns as far seaward as 1200 miles off the Oregon coast. Prior to this expedition, eggs and larvae had been routinely collected 200 to 300 miles off the California coast and on one occasion about 450 miles west southwest of Point Conception. The offshore extent of routine collections and not the distribution of fish determined these distances. Since eggs and larvæ had been taken at almost all of the westernmost collecting stations during the spawning season, it was obvious that the spawning area in the past extended beyond these limits. Small numbers of eggs and larvæ were collected also a little farther north than in previous years.

During this expedition the Service's exploratory fishing vessel *John N. Cobb* obtained a similar range extension for adults. Previously known from as far north as the Queen Charlotte Islands in British Columbia, adults were taken on this expedition in the Gulf of Alaska, which is some 200 miles farther north. They extended about 500 miles to the west, almost to Kodiak Island. The westernmost adults in the Gulf were about 700 miles directly north of the eggs and larvæ collected 1200 miles west of Oregon. This extended adult distribution agrees with the spawning range extension revealed by the egg and larvæ distribution.

When attempting to explain the mechanisms responsible for fluctuations in the catch of a species, such as the jack mackerel, it is essential to know the full extent of its spawning range, as well as its entire range. In considering the area that must be explored to accomplish this, cooperative cruises like NORPAC are the most practicable solution. The extensive data collected in this fashion augment the knowledge of several agencies, each of which may be investigating some particular biological or physical aspect of the ocean. The advent of NORPAC indicates a trend toward such cooperative surveys.

Tagged Bigeye Tuna Recaptured

Of some interest was the recaptu of the first tagged bigeye tuna in t Pacific. The fish was tagged on Ja uary 31, 1955, 400 miles northe of Midway Island. It was recaptur by a Japanese longline vessel on N vember 24, 1955, 690 miles due no of Oahu. The tagged fish had be at liberty for a period of 10 mont had moved at least 800 miles and h grown approximately 10 pounds. T recovery is surprising when it is r lized that only 82 tagged bigeye h been released in the North Paci and the fishing vessel making t recovery was seeking bigeye t north of the Hawaiian Islands the Japanese fresh fish market.

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Report from **Washington**

Items Gleaned from the Nation's Capital

EGISLATION DELAYS.--It is becoming pretty clear here that no new fish-ries legislation is going to be passed in a hurry. Part of this is due o the complications involved within the industry, but two other things lso are helping to delay matters.

First is the fact that this is the year for national elections, nd every bill and measure that comes along for consideration is put under he miscroscope by both Republicans and Democrats for its possible effect pon this fall's voting.

Second is the recent announcement that Secretary of the Interior ouglas McKay is resigning his Cabinet post to run for Senator from his ome state of Oregon. As a former Governor of that State, McKay is con-idered the one Republican who can beat the present incumbent, Senator ayne Morse, who was elected as a Republican but switched over to the emocratic side in the midst of his term.

Here in Washington Morse is regarded as an unpopular turn-coat, ut he still has a following back in Oregon, and insiders expect a hot ight between him and McKay this fall. Meanwhile, those two hard-working alifornia Representatives, Bob Wilson from San Diego county and James Utt rom Orange county, are doing all they can in the House to advance isheries legislation . . . and they are hopeful of results a little ater on.

--o--

HE PRESIDENT'S DECISION.--Biggest news out of Washington this past month as President Eisenhower's decision to run again. Strictly speaking, is announcement was only that he was willing to stand for re-nomination if he was wanted."

On the latter score there is no doubt; Republicans everywhere reeted the news with such glee that it is the general opinion here that isenhower will be selected at the nominating convention in San Francisco nanimously and by acclamation.

The "big three" from California--Nixon, Knowland, and Knight-- re expected to become more harmonious and gradually straighten out their ain differences by the time the convention rolls around.

Only real problem in the Republican ranks at this time seems to enter around the vice president . . . and insiders here do not regard that s such a problem as the country at large seems to think. Ike likes Nixon ecause he's young and energetic, works hard and has great common sense. lso, Nixon handled himself and his affairs better than most other brass ats during the days when Ike's condition was a question mark.

Consequently, the smart betting here is that it will be an Eisen-ower and Nixon ticket again . . . although there is an outside chance that

Nixon might be "promoted" to a Cabinet position and then Ike's running mate likely would be one of these two Republican Governors, Herter of Mass.) or Governor Thornton (of Colo.); or one of these two ex-Governors, Stasson of Minnesota or Dewey of New York.

--o--

THE DEMOCRATS' DILEMMA.--The "big three" in Democratic circles continue to be Stevenson, Kefauver, and Harriman . . . and as of today they are running in that order.

Adlai is still in the lead but insiders here do not think he has the nomination cinched by any means. It looks like a fight down to the finish, and may end so even as between Stevenson and Kefauver that Harriman may get the nod from the convention.

Until Eisenhower announced, some of the wise boys here were favoring the Democratic Governor Lausche of Ohio. Now they feel that he is too smart to want to run against Ike and young enough that he can afford to wait four more years when he might stand a better chance.

The real fight seems to be between Adlai and Estes. If, at the finish, Kefauver is losing out there is a strong possibility that he will swing his votes over to Harriman in return for a sure spot as vice presidential nominee.

The influence of ex-President Truman seems to be at a new low around here. He has been caught in many inaccuracies in his "memoirs" and in some foolish statements in his public appearances. However, he still loves to "give 'em hell" and probably will participate just as actively as party leaders will allow.

--o--

MAGNUSON BILL.--Senator Magnuson (Wash.) on February 23 introduced on behalf of himself and Senator Kuechel (Calif.) a bill to create a new federal fisheries commission to replace the Fish and Wildlife Service.

The bill, S. 2375, calls for the establishment of "a sound and comprehensive national policy with respect to the development, conservation or preservation, management and use of fisheries resources, to creat and prescribe the functions of the United States Fisheries Commission, and for other purposes."

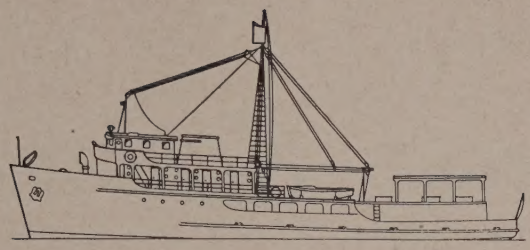
It is reported that a bill to be introduced in the Senate next week will provide for a loan program for the fishing industry to be administered by the new Fisheries Commission, and also will provide a mechanism whereby the new Commission may limit "unreasonable" imports of fishery products.

--o--

ANOTHER MAGNUSON BILL.--On Thursday, March 1, Senator Magnuson, on behalf of himself and Senator Kuechel, introduced a bill, S. 3339, which is described by Senator Magnuson as follows: ". . . a bill to provide for the stabilization of the domestic fisheries industry in the U.S. through the creation of a Fisheries Stabilization Corporation, to bring about a better balanced flow of fish and shellfish and the products thereof in interstate and foreign commerce, and for other purposes."

In commenting further on the bill, he said: "The Corporation would be authorized to take steps to stabilize and revive the fishing industry

(Continued on page 1



Fishing Boat Design

A NEW BOOK, "Fishing Boat Tank Tests," which gives the results f a series of 335 tests with fishing oat models, has just been issued by ıe Food and Agriculture Organiza- on of the United Nations, Rome, :aly.

The information contained in the ublication has been gathered from ishing boat designers in various arts of the world, including the esults of tests conducted for FAO. Ir. Jan-Olof Traung, Chief of the 'ishing Boat Section of FAO Fisher- es Division, compiled the work with he help of three assistant naval rchitects from U.S.A., Sweden and witzerland.

The publication is designed spe- ially for naval architects and fish- ng boat builders. It has been pro- luced in loose-leaf form in a plastic over, with pockets for working notes nside the cover.

Each data sheet deals with a spe- ific model, stating whether the nodel was made of wood or paraffin vax, whether turbulence stimulators vere used, and the actual dimensions f the hull.

A lines drawing, including a body lan, of the ship, and information bout the section area curve and the ongitudinal position of the center of uoyancy, are also given on the data heet. The results from the tests them- elves are shown in a special dia- gram.

The fishing boats covered are nostly in the range of 50 ft. to 80 ft. ut there are also tests published on oats of about 100 ft. length. The ype of hull varies from that of very eavy displacement-length ratio, as n Swedish trawlers, to that of very lender fishing boats, such as the Pakistan canoe-type fishing vessels, nd boats with very high prismatic o-efficients, such as Icelandic trawl- rs, which have a prismatic of about 0.7, to some experimental hulls, with a prismatic as low as 0.5.

There are many differences in the length/beam proportion and a variety of types of stern, such as transom, counter, fantail and cruiser, have been tested. Some results are given from tests with boats having single chine or double chine and a number of the tests are "systematic" or at least related to each other. There is a very interesting series of tests of 100 ft. Boston-type trawlers in which three types of bow were combined with three types of stern, thus producing nine alternatives.

There are tests of 150 ft. U.S. tuna clippers in which two types of bow —a bulbous and a moderate U-shaped —were tested against two types of stern—fantail and cruiser—producing four different models. The publication also includes the results from tests with hull types related to fishing boats, such as rescue cruisers, tugs, submarine chasers, and even a motor sailer.

This is a specialized technical publication of great practical value to all naval architects engaged in trying to design improved fishing vessels. But it should not be used by non-professional men, for all kinds of boats—both good and bad—are covered by the tests.

It is hoped that the publication of these tests, many of which are original, will induce naval architects possessing fishing boat model test results to submit these results to FAO so that data sheets may be published to cover practically every model test being made of a fishing vessel.

The publication may be obtained from any FAO sales agent or direct from FAO, Rome. The published price is $10, and this entitles the buyer to receive, free of charge, all new data sheets on resistance tests as they are issued. ★

Market for Boat Engines in Pakistan

More than 1000 fishing boats in the Karachi administration area and some hundreds on the Makran and Sind coasts may provide a good market for manufacturers of fishing boat engines, as plans develop for the mechanization of the fishing fleets.

Most of the existing boats, which range from small craft to vessels of 60 ft. overall, are suitable for mechanization, according to a Report submitted by the Food and Agriculture Organization to the Government of Pakistan.

The Report has been written by four naval architects of Fisheries Division, FAO, and is based on work carried out by them between 1953 and 1955, after FAO was requested by the Pakistan Government to make a study of "certain local types of fishing vessels used on the West Pakistan coast," with the object of improving the design of the boats so that they could be mechanized.

After extensive investigations and model tests, the naval architects found that most Pakistan fishing boats were comparable (and in some cases superior so far as resistance is concerned) to the design of fishing boats in Europe and North America. As a result, the architects found that the resistance of West Pakistan boats could be decreased by only 10-20% by means of improved hull design, compared with a decrease of 30-40% which they had usually found feasible in the ordinary fishing boats of Western countries. The practical effect of such improvement is to increase the speed of the boat without adding to the power of the engine. Considerable savings can also be made in fuel consumption, sometimes as much as 30% if the speed is kept constant.

The main suggestions made by the naval architects concerning structural modifications to boats are to strengthen them and introduce fixed decks, which would enable the boats to fish in rougher weather conditions. The main need is for manufacturers to organize training in the operation, care and maintenance of engines, and provide an adequate spare parts service.

The FAO Report itself provides a valuable guide to the conditions and problems which exist in this potential market. It may be obtained, free of charge, from the Food and Agriculture Organization, Rome, Italy.

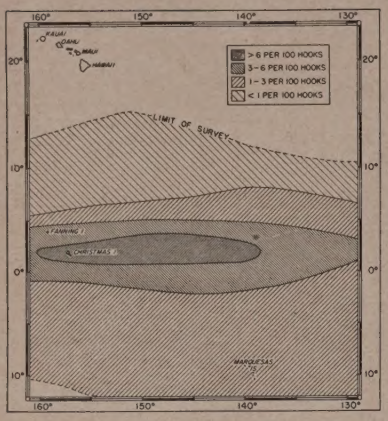


Figure 1—Abundance of yellowfin tuna in the central Pacific.

Recent Equatorial TUNA RESEARCH

By ALBERT L. TESTER
Director,
Pacific Oceanic Fishery Investigations,
U.S. Fish and Wildlife Service

As is well known to many of our readers, the Pacific Oceanic Fishery Investigations (POFI) was established in 1949 to evaluate the aquatic resources of the central and western Pacific Ocean. As envisioned, the program involved much more than simply conducting superficial surveys of the abundance of fishes; rather, the plan was to study first the oceanic circulation of the area in order to locate regions of the ocean that were favorable to the existence of concentrations of commercially valuable species.

For several reasons, the first area selected for study was the equatorial region south of Hawaii. In this area, available oceanographic information suggested there was upwelling, or enrichment, of the surface waters at and near the Equator. Our initial research confirmed this and, further, indicated that this enriched water moved northward to about 5° N. latitude. It was reasoned that in this general zone between the Equator and 5° N. latitude there would be unusually favorable circumstances for the existence of tuna.

Initial attempts to survey the tuna met with rather sporadic success until the Japanese longline was used. This gear, fished systematically from north to south across the equatorial zone, revealed that there was an unusually dense concentration of large, deep-swimming yellowfin occupying the area shown on the chart (Figure 1).

It is possible that this band of yellowfin could have been located more quickly by eliminating the study of the environment, but this seems doubtful in view of the immense area of the equatorial Pacific and, furthermore, there would have been no way of knowing whether the band of tuna was a permanent concentration or merely a transient population. In contrast, our integrated studies of the circulation, the productivity, the food supply, and the tuna give us confidence that the resource is a reasonably stable feature of the ocean.

The first attempts to fish commercially in the equatorial area followed the extensive exploratory work by POFI which showed that the resource was indeed present during most periods of the year and that the catch rates, on the average, were high enough to support American fishermen. Another factor in the timing of the initial exploitation in early 1954 was the very favorable status of the tuna market insofar as Amer can fishermen were concerned.

The first attempt to fish in the are was made by two vessels from th west coast, the *North American* an the *Alrita*. These vessels, using Ame ican crewmen, were rigged for lon line fishing and together fished a aggregate of about 120 days in th general vicinity of Christmas Islan during the period February to Apri 1954. They were aided by POFI i this initial venture to new fishin grounds to the extent of partly d fraying the cost of tooling up for new type of fishing.

Considering the numerous hand caps, such as using new gear an fishing in strange grounds, these ve sels did remarkably well. Their cat rates (shown in Figure 2) were hi enough to be profitable but not hi

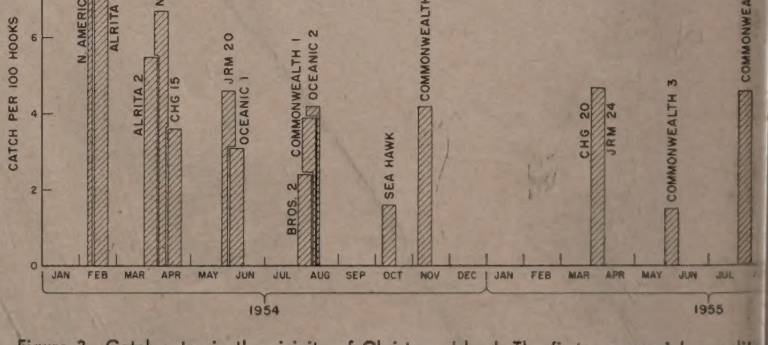
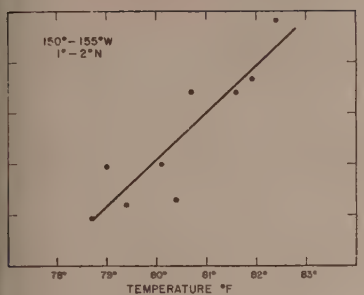


Figure 2—Catch rates in the vicinity of Christmas Island. The first commercial expedit appear on the extreme left.



gure 3—Yellowfin catch and temperature the surface layer of water (1950-1953).

nough to make the venture spectacularly successful.

Following this initial attempt, here were several other less pretentious ventures into the Line Islands ishery. As shown in the figure opposite, these were not as successful as he earliest trials. Reasons for this lie artly in the use of new and relatively untried gear, but also it is ery evident that there was a real ecline in the abundance of yellowin in the Line Islands area during he latter half of 1954, a decline hich persisted into 1955.

At first glance it might appear that hese experiences are simply a reptition of the frequently observed attern of good fishing when a new round is first utilized, followed by subsequent decline. This argument loes not seem reasonable. The area nvolved is vast and the number of ish taken by the first commercial entures must surely have been insignificant in comparison to the total opulation.

In addition, we now have evidence t hand to show that the decline in una abundance after 1954 was related to a change in the environment n the Line Islands area. In fact, the oorer fishing might have been predicted had our knowledge then been up to the present level.

Briefly, our explanation for this poor fishing follows the logic used in first locating this new fishing ground. We have noted that the newly upwelled water found at the Equator is considerably cooler than the water to the north and south and generally contains few fish. As the water moves northward it "matures," a condition reflected in an increase in temperature, and the following biological succession takes place: the nutrient salts or fertilizers stimulate the growth of minute aquatic plants which, in turn, support an augmented supply of tiny plankton animals and these, in turn, furnish food for tuna forage.

some time ago, and while it was maturing tuna forage developed, and tuna concentrated in the area. Apparently these variations are the result of variations in the equatorial winds; strong winds drive the water rapidly northward to the sinking of convergence zone and moderate winds allow the tuna forage to develop before the water sinks.

Following this very promising lead, we examined the oceanographic data from our station at Christmas Island and found that much the same story could be derived from this more recent information. The relationship between ocean water temperature and tuna fishing during the 1954 period, when fishing was very concentrated and the catch rates quite

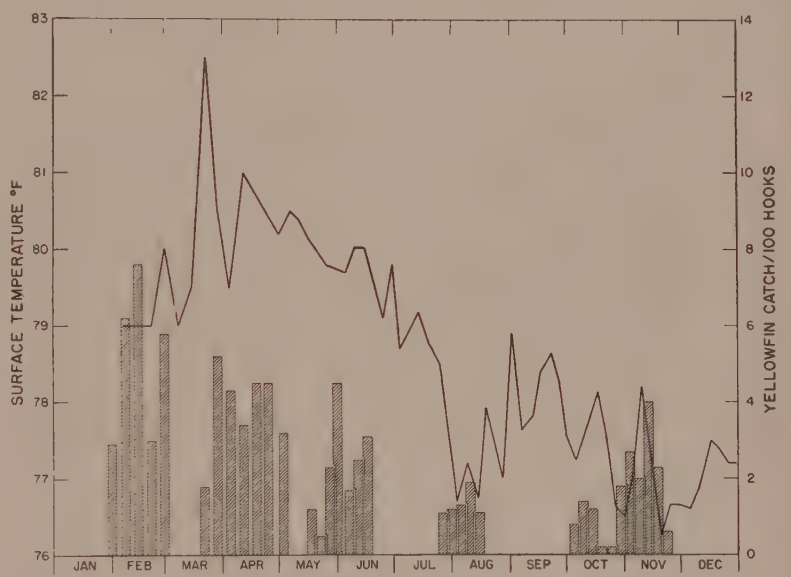


Figure 4—Water temperatures and yellowfin catch rates in the vicinity of Christmas Island, 1954.

The tuna, of course, may be expected to congregate in areas possessing an unusually large supply of food, and to move out of these areas if they suffer a decline in the food supply. According to our theory, a decline in food supply would be indicated by a decrease in temperature.

A recently completed critical examination of experimental fishing results from 1950 to 1953 shows that the success of fishing in the Line Islands area was closely related to the temperature of the water (Figure 3). The very cool water, 78° to 79° F. in temperature, has been recently fertilized and has not yet developed a supply of tuna food.

The warmer water was enriched

reliable, is depicted in Figure 4. It is very clear from this that the decline in fishing success in the vicinity of Christmas Island was paralleled by decline in the water temperature in that area.

Thus it appears that we have a plausible explanation of the poor fishing subsequent to the early part of 1954—an explanation which is related to changes in the equatorial circulation. As in all probability these changes are related in turn to changes in the weather, it is conceivable that more detailed knowledge of the weather may lead eventually to long-range forecasts of fishing success in the equatorial region.

(Continued on page 21)

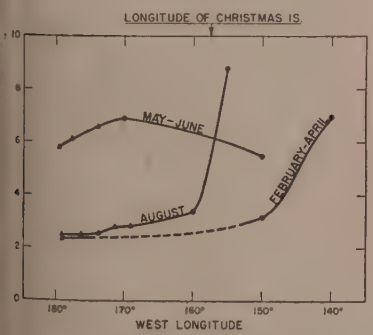


Figure 5—Yellowfin catch 1953, 5°N.-5°S., showing the east-west shifts in abundance.

EBB 'n FLOW

Fish Parade Dates

National Fish Parade plans and dates—October 29 to November 3—were announced to frozen food packers and distributors at their recent convention in New York City. The release added:

"Fish has a great potential; seafood is a magic word when it comes to dining in restaurants . . . it could be when home menus are planned. Fish is a versatile food, and here is an industry willing to promote its products with a Fish Parade, a national campaign."

New Type Plastic Boat

A new type of fiber glass plastic boat is trade-named "Molded Fiber Glass." The new 15-foot 7-inch lapstrake boat is said to be etxxremely strong because made by an exclusive seamless preform process, and molded in one seamless piece in matched metal dies. Reinforcing cross-ribs of parallel-strand fiber glass, bonded to the hull, add extra strength.

The hull, with color molded in, is said to require no maintenance or painting. Fiber glass plastic does not corrode or rot, nor attract barnacles or other marine life in salt water. It is also said to be difficult to dent or scatch. Write Molded Fiber Glass Boat Division, 45 Fourth Ave., Union City, Pennsylvania.

Philplug Anchoring Compound

The next time you have an occasion to put a screw back in a hole where the wood has rotted, remember "Philplug"—a product of New England Carbide Tool Co., Inc., 60 Brookline St., Cambridge 39, Mass. All boat owners know the difficulty of getting a replacement screw into wood that has rotted and will not hold it. Wood filler plugs, broken matches, lead or plastic plugs are at best only stop-gap-methods.

Philplug is a mixture of asbestos and cementatious powders, which you moisten with a little water, roll into a plug and tamp into the hole. That's all there is to it. It will fit any size hole and screws inserted in it will never rust.

"David Frances" Becoming "Little David"

A new 65 foot dragger, the "David Frances" had original designed capacity of 75,000 lbs. of iced fish, but her catches have been running to 85,000, 89,000 and a whopping 91,000 lbs., giving her owners increased satisfaction with each succeeding trip. Talk has begun that since she has been bringing in such "Goliath" loads from her 64 ft. 10 in. hull, a more descriptive name would be "Little David."

One reason is because the boat is powered by an Atlas Imperial Diesel, delivering 195 continuous h.p. at 1225 rpm. Edward Hansen, her captain, is especially pleased with the ease of handling and ample reserve of power that the Atlas engine provides. The engine was built in the plant of White Diesel Engine Division of Springfield, Ohio.

Bendix-Marine Sales Representative

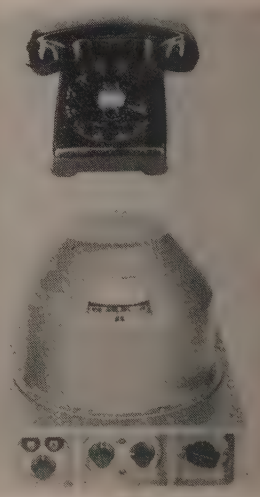
The appointment of Donald E. DuChane as Marine Sales Representative for Pacific Division, Bendix Aviation Corporation was announced at North Hollywood, California, by Walter P. Rhea, Manager, Marine Department. As a member of the sales staff DuChane will contact dealers on sales and service of Bendix Marine Products in Southern California.

Diesel Fuel Injector

A controlled and more uniform fuel injection suitable for any diesel engine, resulting in more torque, more horsepower and longer engine use before overhaul, is claimed for the Parker Fuel Injector. Better-than-new-performance for old engines is also claimed.

For each cylinder of the engine, there is a pressure-control valve and a fuel-pressurizing plunger.

The injector is simple in operation. It is easy to mount on the crankcase panel of engines from 20 to 100 hp per cylinder. Each unit, built of uniform parts, covers a wide range of bore, stroke and rpm. Individual pump units for each cylinder are also available. Write Parker Diesel Engineering Company, 945 19th Ave. Oakland 6, Calif.



Smallest Gyro Compass

This tiny "Arma" subminiatu Gyro Compass shown here in sca with a standard telephone handse is said to give continuous, high-acc racy heading information under co ditions that would destroy the acc racy of any of its tremendously bi ger predecessors. It is easier to op ate and maintain and will withsta service in the world's most rugg land, sea or air service. Simple to stall, easy to operate. For additior information write Vernon H. V Diver, Room 1303, 12 East 41st S New York 17, N. Y.

TIDES OF THE INDUSTRY

alifornia's Sardine Catch

Landings by California's fishing et totaled about 75,000 short tons ring the season which closed Feb- ary 1, 1956, according to prelimi- ry reports received by the Califor- Department of Fish and Game. e 1955-56 catch increased about % over the 67,000 tons landed in 1954-55 season.

Both the 1955-56 and the 1954-55 ch totals could have been exceeded nsiderably had there not been wage d price disputes and some adverse rket conditions.

In both fishing seasons the catch resented sardines migrating north m Mexican waters, with practic- ly none caught north of Morro y. Virtually none were landed at onterey, and the fish processed ere were trucked north from south- n California. The catch was good the Santa Barbara and Port Hue- me areas early in the season and ter spread south as far as Ocean- le.

Washington Salmon

Salmon production in Washington ate last year totaled 63,600,000 unds having a wholesale value of 23,245,000, according to the Depart- ent of Fisheries.

Leading the five species was pink lmon which contributed 31,900,000 unds worth $8,000,000. Chinook lmon totaled 10,400,000 pounds id $5,210,000 wholesale value, fol- wed closely by 9,340,000 pounds silvers worth $5,050,000.

In numbers of fish the catch was pproximately 8,700,000. The 20- ar average is 6,584,000 fish. Land- gs of chinook, silver and pink sal- on equalled or exceeded the long- rm averages. The sockeye catch of ,000,000 fish was the second larg- st on this cycle since 1935. A poor hum season on Puget Sound reduced he statewide total to 440,000 fish, ne-half of normal, despite an excel- nt 250,000-fish season on Grays and Willapa harbors.

The 1954 totals were 6,970,000 sal- on weighing 59,420,000 pounds and aving a wholesale value of $27,- 22,000. The larger value came from he exceptional Puget Sound sockeye atch of 4,500,000 fish.

Herring Catch Quota

Improved conditions in the herring fishery of southeastern Alaska will permit the catch quota for reduction purposes to be increased to 17,500 tons (140,000 barrels) during the 1956 fishing season, John L. Farley, Director of the Fish and Wildlife Service, said upon the signing of an amendment to the Alaska commercial fishing regulations. In 1955, the catch quota was limited to 100,000 barrels.

FWS biologists report that Alaska herring are increasing from their low numbers of past years. Natural conditions in Alaskan waters during the past three or four years have been favorable for the growth of herring, as a result of which an increase in the 1956 supply is indicated.

Turbine Fishing Vessel

The first turbine-driven fishing vessel in the world is now being tested in West Germany. The *Braunschweig*, built by a Cuxhaven shipyard, was placed in service at that port by a German fishery firm. A sistership, *Hof*, is lying in the fitting-out yards, and the *Frankfurt Am Main*, another sistership, is already on the stocks.

Profit considerations mainly led to the building of a turbine-operated trawler. Apart from this, the unit requires less space. The single housing turbine develops, at its highest point, 1,000 hp, allowing a speed of approximately 13.5 knots.

All pumps are electrically driven. A low-pressure steam installation for distillation of seawater is also built in. The turbine permits usage of a variable-pitch propeller.

The chief dimensions are as follows: length over-all 193 ft., length at waterline 184 ft., width 30 ft., height (at sides) 16 ft. The weight of the *Braunschweig* is measured at 652 gross registered tons and 243 net registered tons. The capacity of the fish hold is approximately 5,000 baskets. The hold construction is newly-developed, and shows only smooth bulkheads.

For the so-called "active insulation" of its cover, a new tub system has also been developed. The necessary refrigerating plant is accommodated under the forecastle. A hatch in front of the mast and three large modern hatches aft, lead to the hold itself. The latter have a three-piece cover and complete insulation. Their extended length permits two discharging gangs to work simultaneously at the same hatch. Unloading requires less time.

On the forecastle is an electrically-driven lifting winch. The *Braunschweig* has an action radius of 35 days. The 24-man crew is accommodated aft. A long gang-way passes through the superstructure. A hospital is also accommodated here. The vessel is equipped with all the latest electronic equipment.

Albacore Crosses Pacific

The albacore, which suddenly appears off the Southern California coast in mid-July and disappears again in September, may be making a round trip across the Pacific Ocean during the period it is gone from California shores.

This point was established recently with the recovery off California of an albacore tagged by California's Department of Fish and Game in almost the same spot 11½ months before.

Previously four California-tagged albacore had been recovered by Japanese fishermen—two off Japan and two in mid-Pacific. One of these fish had been tagged at the same time and place as the one just recovered off California, and had been at sea six months—just half the time it took the California recovery to get back to the original tagging spot.

Tagged Sturgeon Recovered

Another sturgeon tagged in September 1954 by California's Department of Fish and Game in San Pablo Bay, Calif., has been recovered off the mouth of the Columbia River near Astoria, Oregon.

This recovery brings further verification of the fact that there is an interchange of the big fish between the Sacramento and Columbia River systems.

The second migrant taken was a 41-inch green sturgeon, caught December 5, 1955, by a commercial fishing boat of Astoria and returned to the Oregon Fish Commission.

A STUDY OF YELLOWTAIL

Conducted by the California Department of Fish and Game

OBJECTIVES of "Project Yellowtail" conducted by the California Department of Fish and Game:

1. To establish the range of the yellowtail. To determine whether separate subpopulations exist. To determine whether and to what extent yellowtail move throughout their range.
2. To determine the age and rate of growth, and the egg production at various sizes and ages. These are important in setting size limits and in estimating how rapidly the abundance might increase as a result of regulations.
3. To study food habits.
4. To determine the spawning grounds, spawning seasons and spawning habits of yellowtail as basis for proper regulations.
5. To evaluate the effects of fishing pressure on the stocks. Scarcity may be due to over fishing.
6. To determine whether water temperature or oceanographic conditions materially affect the abundance of yellowtail.

Tangible and Specific Results:

1. The yellowtail, *Seriola dorsalis*, range from Central California (Monterey Bay) south along the Baja California coast and into the Gulf of California. They are most abundant between Sebastian Visciano Bay, lat. 28° 20′ N. and Magdalena Bay, lat 24° 20′ N. California is on the fringe of the population.

The indications are that these fish are all part of the same population, that they intermingle enough so that there are no tangible physical differences.

Marking yellowtail to determine the extent of their movements and to aid other studies has been very successful. Of 15,106 fish tagged, there have been 255 recoveries. Most of the returns, 88.7%, showed no movement. Two hundred and twelve yellowtail, recovered from two to 767 days after being tagged, were recaught in virtually the same area where they were released. The average time out was 121 days.

Only 11.3% or 27 fish moved more than 50 miles. These yellowtail were at liberty from eight to 645 days with the average time out 204 days. The longest movement was 360 miles N.W. Of those fish tagged between January and August there is a slight tendency toward northward migration. Those tagged in September tended to go south. Only four yellowtail moved from Central Baja California to the grounds most exploited by California recreational fishermen, including Los Coronados Islands.

At the inception of the Project no satisfactory tag for marking large game fish such as yellowtail was known. The plastic tubing tag developed by the California Department of Fish and Game has been very successfully used on yellowtail and the tunas. It is now in use by many other agencies in this country and abroad.

2. With the return of 42 whole tagged yellowtail, all of which had been at liberty more than 20 days and from which lengths were taken both at the time of tagging and again on recapture, the Project has begun to obtain good information on growth rates.

Yellowtail Growth from Tagging Data

Fork length now, inches	*Length 1 year from now*	*Increase inches*
22	28¾	6¾
28	30¾	2¾
30	31¾	1¾
32	33½	1½
40	40¼	¼

Age analysis of yellowtail has been very difficult. However, from reading the growth rings on the scales the age-length relationship is probably about as follows:

Age Years	*Average fork length Inches*	*Size range Inches*
1-2	20⅞	14½-24¾
2-3	24⅞	17⅜-32¾
3-4	28	21⅝-34½
4-5	31⅝	28⅔-35⅜

3. Yellowtail stomachs have been examined both quantitatively and qualitatively to determine the food habits. The indications are that they eat whatever is most abundant in the area where they are located. Below Sebastian Viscaino Bay red swimming crabs are extremely abundant and sometimes give a red tingle to

ocean for miles. They are the dominant food of the yellowtail. Further north, anchovies and squid are more important. Many things have been found in their stomachs such as: mackerel, flying fish, herring, rockfish, and even eel grass and rocks.

Maturity and fecundity studies have resulted in the completion of counts and measurements of thousands of yellowtail eggs. The task of analyzing the data is now underway. Preliminary analysis indicated that a 28 inch mature yellowtail will spawn about 1,000,000 eggs. The number increases rapidly with increased size. A 32 inch fish will spawn about 1,400,000 eggs; a 41 inch yellowtail over 2,000,000 eggs.

Nearly mature fish are found throughout their range. Thus, they undoubtedly spawn wherever the schools happen to be when the eggs are ripe.

Tagging has given some interesting data on the fishing pressure on yellowtail.

	No. tagged	*No. returned*	*% return*
os Coronados Islands	46	15	33
anta Catalina Island	72	18	25
uadalupe Island	965	108	11

nalysis of the commercial catch has een quite complicated, and it has ecome impossible to obtain more ıan a rough measure of fishing effort. It is apparent, however, that etween Sebastian Viscaina Bay and Iagdalene Bay, where the bulk of ıe commercial catch is made, yelowtail are plentiful. Poor landings re a result of poor consumer deıand and not shortage of fish.

Surface temperatures were taken at localities where yellowtail were found, the minimum being 59° F. and the maximum 80° F. Fish were found most often between 60° and 67°. The best fishing, however was when the surface temperature was between 70° and 75°. *

Antibiotic Ice for Fish

The use of antibiotics to extend the storage life of fish may prove an economic boon to fishermen and the fishing industry.

Speaking at a meeting of the New England Fisheries Technologists, Dr. Alex A. Malaspina of the Technical Service Department of Chas. Pfizer & Co., Inc., said that the use of antibiotics not only will permit fishermen to stay at sea longer and obtain greater quantities of fish, but also will maintain the quality of fish when sold.

The reason, he explained, is that antibiotics can extend the freshness of fish up to 100% or more and will permit a longer interval between catch and consumption.

"This," he said, "will permit travel or shipments for longer distances, opening up new markets."

Dr. Malaspina explained that fish is a very perishable food because it is an ideal medium for the growth of bacteria. Bacterial spoilage starts the moment the fish are caught, he said. It is the antibiotics' ability to fight bacteria which gives them their food-preserving value, he added.

Numerous investigators, the group was told, have concluded that a broad spectrum antibiotic like Biostat is most effective in extending the freshness of foods. When added to foods at practical low levels this type of antibiotic is not lethal to the bacteria but merely inhibits their growth and development.

"Thus," Dr. Malaspina added, "Biostat does not sterilize but depresses the rate of bacterial spoilage, thereby prolonging the normal storage life of the product."

"The low levels used in no way affect the color, texture, flavor or odor of the food," he added. Neither do Biostat-treated foods, if they are properly cooked, pose any problem for the consumer, he said, explaining that this antibiotic is destroyed by the amount of heat involved in cooking.

For best results, he pointed out, the antibiotics should be used in conjunction with refrigeration.

Dr. Malaspina warned, however, that antibiotics are effective only when the food processor practices good sanitation for they cannot be used to disguise spoilage that has already contaminated food.

Antibiotic treatment should start immediately after the fish have been caught, the Pfizer technologist said, explaining that the flesh of healthy fish, although normally bacteriologically sterile, is quickly contaminated by the bacteria in slime or viscera.

He suggested various methods with which fishermen and processors could use antibiotics to advantage: dipping the fish in small concentrations of the antibiotic just before icing; using antibiotic-ice, or using refrigerated salt water containing the antibiotic.

"Of the three," he said, "the use of antibiotic-ice seems the most convenient and practical method."

Dr. Malaspina suggested, also, that Biostat should be valuable in processing frozen fish for market.

The brine into which fillets are dipped is an ideal area for bacterial growth, he explained, adding that substantial multiplication of bacteria takes place on the surface of the fillet during the freezing period.

"To avoid this problem and to obtain a high quality product which will withstand better any accidental adverse storage conditions," he said, "it would be beneficial to add an antibiotic such as Biostat to the brine."

Meetings on Fish Stick Standards

Fishery officials of the Fish and Wildlife Service will hold a series of public conferences in eight key cities from March 2 to April 5 to consider proposed standards for grading frozen fried fish sticks.

Director John L. Farley announced that FWS technologists, with the active cooperation of the fish stick producers, have prepared the provisional draft of a voluntary standard. This is now ready for consideration by those who will be concerned with the application of the standard when it goes into effect.

In addition to producers of frozen fish sticks, these meetings will be of interest to raw material suppliers, transportation agencies, cold storage operators, wholesalers, retailers, and consumer groups, as well as the trade associations operating in these fields.

Survey on Sardine Spawning

ONE of the fundamental problems in investigating the Pacific sardine is determining the number of fish in the population along the west coast of the United States and Baja California. Each year independent estimates are made by various methods and then compared. One such estimate is derived from a census of the total number of sardine eggs spawned each year.

A current study by the South Pacific Fishery Investigations of the United States Fish and Wildlife Service on sardine fecundity specifies three questions that must be answered to determine the number of fish in a spawning population: 1, How many eggs does each female produce per batch on the average? 2, How many batches of eggs does each female produce, on the average, during a season? 3, What is the ratio of males to females in the population?

The number of eggs spawned per batch has been determined for females of various sizes and ages and the sex ratio of the population is estimated each year by routine sampling methods, but the number of batches of eggs spawned by each female is unknown. Although it is a relatively simple matter to examine a fish and count the eggs present at any given time, the difficulty arises in not knowing how many times such a fish develops and spawns a batch of eggs during a season.

For the past several years sardine population estimates based on the total number of eggs spawned per year have assumed that each female spawns three batches a season, producing a total of 100,000 eggs. In reviewing all the evidence on this point, however, it may be concluded that the number of batches spawned per year is still a moot question. It is a difficult problem to solve for most egg-laying marine fishes and no method has been devised that will yield conclusive results.

Population estimates based on the total number of eggs spawned per year are further complicated by the fact that the number of eggs present in the ovaries increase with age, or more precisely, with the weight of the fish and also by the fact that some unknown portion of the younger fish is not sexually mature. Current work shows the number of eggs per batch in the ovary varies from approximately 8,000 for the smaller females to 50,000 for the larger females. This relationship can be expressed in an equation from which the total weight of spawning females can be calculated, once the total number of eggs in the sea is known.

The present study also describes incipient egg development in a third of the one-year-old and in over three quarters of the two-year-old sardines, whereas it has been assumed in the past that only a half of the two-year-old fish are sexually mature. It is clear that more extensive study is needed to estimate accurately the portion of one and two-year-old fish that spawn each year.

The number of batches spawned per female and the portion of younger fish that spawn can best be inferred from examination of great numbers of fish captured at regular intervals throughout the year. Such an analysis is planned for the future. Past and future population estimates based on number of eggs in the sea will be confirmed or modified as information accrues from studying egg production and spawning in the female sardine.

Shrimp in Japan

The Japanese catch of shrimp the last few years has been averaging close to 100 million pounds annually. Most of the catch is consumed in Japan, but some frozen, canned, and dried shrimp are exported. The United States' share of the frozen shrimp exports was about 89.4% of the 273,000 pounds exported in 1953 and 92.8% of the 291,000 pounds exported in 1954.

The principal shrimp fishing areas in Japan are Uchiurs Bay, Hokkaido; the waters off northeastern Hokkaido; the Inland Sea, Osaka Bay; Ise Bay; and Ariake Bay, Kyushu. The fishing season is from June through September. About 90% of the catch is made by small 15-20 ton trawlers using trawl nets. The remainder of the catch is taken by miscellaneous boats using a number of types of gear.

Most of the vessels catching shrimp, especially the trawlers, do not catch shrimp exclusively, but take all types of fish, among which shrimp average about half the catch during the shrimp season. There are no known freezing plants or canneries which operate exclusively for shrimp; during the shrimp season the plants which handle other types of marine products and canned goods simply take on shrimp as an additional line. At the present time there is little prospect of any unusual expansion of the shrimp fishery.

Japanese Tuna Fishery in Indian Ocean

The tuna fishing in the Western Indian Ocean, developed by Japanese long-line fishermen, is yielding catches of 12 to 14 yellowfin per 100 hooks. This is a much higher catch rate than on any other grounds fished by the long liners.

The Nankai Regional Fishery Research Laboratory, the Japanese government agency most active in tuna research, is planning to investigate oceanography and tuna ecology on the long-line grounds of the Indian Ocean. The expedition is being made in cooperation with the fisheries department of the University of Kagoshima, using the University's training ship *Keiten Maru* (510 tons), sailing in January and returning about the middle of March.

Last December the No. 2 *Seiten Maru* (750 tons) returned to the port of Shimizu, Japan, with a full load of 425 tons of yellowfin and bigeyed tuna after an 80-day voyage that extended across the Indian Ocean to the vicinity of the African coast. The average day's catch was reported as about 12 tons of yellowfin. It is said that 70% of the catch passed inspection as suitable for export, that the proceeds of the voyage will amount to about US$90,000, and that crew members will receive about US$2 each for the trip.

In addition, the large tuna mothership No. 21 *Kuroshio Maru* (1,8 tons) returned in December from new fishing grounds in the Arabian Sea region with 1,063 tons of fish valued at over $160,000. About 70% of this catch was slated to be canned for export. The *Kuroshio Maru* has now sailed for the fishing grounds off Somaliland and Madagascar.

EPORT FROM WASHINGTON

(Continued from page 8)

rough the making of loans to fishermen for boats and gear and to fish rocessors and others engaged in any phase of fisheries activities. The rporation would have a capital of $5 million fully subscribed by the deral Government, and it would be authorized to issue bonds to obtain ldditional funds to carry on its work."

The two Magnuson-Kuechel bills just described are regarded as quite portant and no doubt will stir up plenty of excitement.

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CHEDULED FISHERY HEARINGS.--The Senate Interstate and Foreign Commerce ommittee has named the following to serve on its Subcommittee on Merch-nt Marine and Fisheries:

Warren G. Magnuson (Wash.), Chairman; John O. Pastore (R.I.), Price aniel (Tex.), John M. Butler (Md.) and James H. Duff (Penn.). The Subcom-ittee has set March 19 to begin hearings on all fisheries bills pending efore the Senate at that time, which to date are S. 2375 (Magnuson and uechel), and S. 2379 (Payne). These hearings had been previously set to egin on March 5.

The House Committee on Merchant Marine and Fisheries has made no nnouncement of hearings on House fisheries bills, which include H.R. 8001 Wilson) and identical bills as described fully in last month's issue of his magazine.

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LASKAN FISHERY HEARINGS.--The first round of hearings on H.R. 244 and imilar bills to transfer control of Alaskan fish and wildlife from the epartment of the Interior to the Territory of Alaska were held on Feb-uary 16 and 17.

Testifying in opposition to the proposed legislation were W. C. rnold, managing director, Alaska Salmon Industries, Seattle, Wash.; Jack oods, business agent, Alaska Fisheries Union, Seattle, Wash.; Vito di ercurio, Alaska Fisheries Union, Berkeley, Calif.; Walter Hanson, Alaska erring Industry; and Donald L. McKernan, Administrator, Alaska Commer-ial Fisheries, Department of the Interior. Appearing in support of the roposed legislation were Ken Hinchey, mayor, Anchorage, Alaska; Clarence nderson, director, department of fisheries, Territory of Alaska; Harold ansen, secretary, Cordova District Fisheries Union, Territory of Alaska; nd Miles Brandon, of Anchorage, Alaska.

The hearings have been recessed for an indefinite period, and the roposed change of control seems slated for some tough sledding.

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REEDOM OF THE SEAS ISSUE.--Senators and Congressmen have become greatly oncerned over reports of action taken by the Inter-American Council of urists which met in Mexico January 17-February 4, 1956. At that meeting resolution was adopted which contained very sweeping proposals support-ng the claims of some countries which are now attempting to establish overeignty over several hundred miles of waters off their coasts. The U.S. epresentatives at this meeting made a strong statement not only opposing he content of this resolution but objecting strongly to the fact that t was adopted with virtually no preparatory study, discussion or consid-eration of United States objections, which were strongly stated.

TERRITORIAL WATERS.--An increasing number of Congressmen are expressing concern over the above, and Congressman Bob Wilson (Calif.), a member of the House Armed Services Committee, made a statement on this subject on the floor of the House on February 16. In commenting on the Mexico City resolution, Congressman Wilson said, in part:

:. . . actions have been taken which if followed up will damage the fabric of defense not only of the hemisphere but of the whole world. Basic and fundamental doctrines have been tampered with in a light, carefree manner without study, and debate. Log-rolling tactics have been used which are not condonable in the community of nations.

"Such actions cause one to ponder whether the military aids, the economic aids, the political aids and related policies which the United States has been pursuing in this hemisphere do not need re-examination and re-evaluation. For a small coastal country to claim as its own territory broad stretches of the high seas is a fine thing from the narrow nationalistic view, perhaps. But how is that small country to get its produce to market if the paths to it pass through the territory of other sovereigns? Who is to defend it if its defender's wings are so clipped?

"We are sure that mature study and reflection of these deep and basic issues by our neighbors to the south will cause them to take steps that will correct the irresponsible actions of their delegates at this technical meeting. Otherwise we are just as certain that the United States will be required to re-examine many of its policies on these subjects, and take such actions as its heavy load of world-wide responsibilities demand."

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SPECIAL MEETING ON 3-MILE LIMIT.--A special meeting of the Organization of American States will convene in Ciudad Trujillo (Dominican Republic) on March 15 to consider, among other things, a resolution by which the OAS Inter-American Jurist Council recently went on record as opposing the three-mile maritime limit.

At a meeting of the Council of the OAS on February 24, Chile proposed that the Cuidad Trujillo conference be postponed. The United States opposed a postponement, with the apparent fear that postponement might mean more than merely a delay and that the "Mexico City resolution" might be left standing as the official thinking of the 21 member nations of the OAS. The Chilean proposal for postponement was rejected by a vote of 13 to 7.

Three representatives of the fishing industry are scheduled to attend the conference: W. M. Chapman of the American Tunaboat Association, J. E. Barr of the Shrimp Association of the Americas, and George E. Steele, Jr., of the National Canners Association Fisheries Division.

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SALVADORAN SEIZURE.--On February 1, the Salvadoran Navy captured a Mexican shrimp fishing vessel at a distance of some five to six miles off the Salvadoran coast.

The 1,500-pound catch found aboard was confiscated and a fine of 5,000 colones (US$2,000) was assessed, provided for under the articles of the new Salvadoran fishing law. This detention is the first to take place under the stiff fines provided in the new fishing law.

The GLOBE

An International News File Compiled from FOREIGN REPORTS

American Samoa.—The winter fishing season by the American Samoan tuna fleet, based at Pago Pago, has been very successful, according to Australian reports. The tuna vessels have brought in large catches from the waters east of Fiji, and also from areas around the Cook Islands. Some record catches were reported which may be due to the long periods of clear weather.

Australia.—Funds for investigating the possibility of establishing a tuna fishing industry in South Australian waters has been included in budget estimates of the Australian Legislative Assembly.

The sum of US$17,900 has been provided for the purchase of a fishing vessel to be used in the research work and for the catching of live bait. Additional funds of US$21,300 were provided for a thorough investigation of the tuna fishing possibilities. Two United States tuna fishing experts will be brought to South Australia and will use another boat based at Port Lincoln.

Dutch Guiana.—A new shrimp freezing and packing plant is expected to start packing shrimp in Surinam soon, according to a report from the U.S. Consul at Paramaribo. The new company, Surinam American Industries, Ltd., will be managed by two United States citizens experienced in the shrimp fisheries and refrigeration. The plant is expected to employ 200 persons either full or part time exclusive of the shrimp fishermen. The capacity of the plant is reported to be about 10,000 pounds of cooked and peeled shrimp a day under normal operating conditions with a storage capacity of 100,000 pounds.

France.—Six tuna boats have arrived at Dakar from France and will try tuna fishing on a regular commercial scale off of West Africa. These boats are from the French fishing fleet normally based at St. Jean de Luz. They are newly-constructed and are said to be capable of remaining at sea for a period of up to 15 days with refrigeration facilities for preserving their catch during that time.

Although fishing off the coast of French West Africa has always been an important source of food for the coastal tribes of the area, it is only within the last few years that consideration has been given to commercial fishing for export.

New Hebrides.—Plans for a new tuna cannery in the New Hebrides have been abandoned. The original plan was to base the cannery at Santo and utilize skilled Japanese fishermen and equipment procured in Japan. It is believed that objections by the British residents of the New Hebrides were instrumental in forcing the abandonment of the plan.

Norway.—The annual cod fisheries in the Lofoten waters of North Norway turned out to be very disappointing again in 1955, reports a bulletin from the Norwegian Information Service. The spring catch was 43,580 metric tons, about the same as last year's record low. Average earnings per fisherman, however, were well above last year's because only about 14,000 participated, as against 20,000 in the 1954 season, and also because buyers paid somewhat higher prices.

Norway.—A new invention has been invented called "Light Ray Fishing Sinker" may be used for trolling, trawling, and net fishing. The gear consists of a container constructed by a special yellow-brass alloy able to endure sea water with high salinity and to withstand a pressure corresponding to a depth of over 8,000 feet.

From four "windows" or "eyes" located in the upper part of the container, electric light rays attract the fish. The lower part of the container, equipped with hooks, lies in darkness. When the gear is moved upwards, the fish are immediately hooked.

Norway.—Some 25,000 Norwegian fishermen, manning about 1,700 vessels, including 600 efficient purse-seiners, were based in the west coast port of Aalesund for the 1956 winter herring fisheries. The ocean research vessel G. O. Sars, staffed by Norwegian scientists, helped locate the herring shoals and radiotelephoned information directly to the fishing fleet. To pinpoint the herring, the researchers use several types of electronic instruments, including the recently developed combination sonar-echo sounder.

Peru.—Experiments using long-line fishing gear for tuna, bonito, shark, and swordfish recently took place 10 to 100 miles offshore from Callao, Peru. The results indicate that this type of gear would be impractical within the area investigated at depths of 20-40 fathoms because of the abundance of giant squid. The giant squad damage and destroy the long lines.

It was reported that the new purse-seine vessels (40-50 feet in length) operating out of Callao are adaptable to long-line fishing except for lack of insulation in the holds of the vessel. This would have to be provided for extended trips.

Venezuela.—The Japanese long-liner "Bozo Maru" owned by a Venezuelan national that has been tuna fishing off the Venezuelan island La Blanquilla put into La Guaira in January with 80 tons of fish. The owner reported that the 80 tons consisted of 15 different varieties (mostly tuna) caught in two weeks of fishing. The Japanese captain, who has been tuna fishing some 20 years, described the eastern Venezuelan tuna grounds as the richest in his experience, states a report from the U.S. Embassy at Caracas.

JAPAN'S *Latest Type* TUNA VESSEL

The *Kuroshio Maru No. 21*, now on her fifth trip to the Indian Ocean between Ceylon and Madagascar, fishing for yellowfin tuna, is one of the most advanced types of tuna vessels owned in Japan, according to a report from the U.S. Embassy in Tokyo.

This vessel, built in 1954, is a refrigerated cargo carrier type of 1,858 gross tons (1,383 deadweight tons), powered by a 2,100 hp. Diesel engine and with a speed of 13 knots. The vessel's equipment includes radar, loran, echo-sounder, direction finder, and gyrocompass.

As the term is used in Japan, a "mothership" is a larger vessel that accompanies smaller or catcher boats that do the actual fishing. The "mothership" acts as a carrier for the catch and as a source of supplies. The *Kuroshio Maru No. 21* does not act as a "mothership" in this sense in that six smaller catcher boats are carried on deck to the fishing grounds. In addition, the vessel is equipped with long-line fishing gear which is fished directly from her own deck.

The trip to and from the Indian Ocean takes about 25 days each way, and the vessel fishes for about 30 days, making the total time for each trip about 80 days. Part of the catch is frozen by mechanical-refrigeration equipment, and the remainder is packed in ice for the return voyage. The catch expected from each trip is slightly over 1,000 metric tons. The owners of the ship state that its operations have been "fairly successful."

Upon the ship's return to Japan, the catch is disposed of through normal commercial channels for fresh use, freezing, and canning. While a portion of the catch may be utilized by the owners in their processing operations, the ship is not operated solely for that purpose.

After its return from the present expedition to the Indian Ocean, the ship will be used from May to September in the North Pacific salmon fishery as a cargo carrier.

Tuna Survey in Line Island Waters

The U.S. Fish and Wildlife Service fishery research vessels *Charles H. Gilbert* and *John R. Manning* returned to their Pearl Harbor base on February 13 and 15, respectively, completing a month-long experimental fishing and scouting operation on the yellowfin tuna grounds of the Line Islands area. According to Dr. Albert L. Tester, director of the Pacific Oceanic Fishery Investigations, the primary objective of the survey was to get information on the abundance of tuna in the area by fishing with conventional troll and longline gear from the *Manning* and by searching for schools with a radar-like long-range sonic fishfinder recently installed on the *Gilbert*.

In general tuna appeared to be scarce around Christmas Island and in the southern part of the area, but some excellent catches were made on the longlines at Palmyra Island, where the best day's catch of 83 yellowfin gave a catch rate of nearly 14 fish per 100 hooks, about five times the average in Hawaiian waters. Longline results at Washington Island were also good. The best trolling was found around Kingman Reef and Washington Island, where fishing with six lines produced an average catch of two to three fish per hour. Troll-caught fish averaged 21½ pounds, longline-caught tuna 65 pounds.

Over 100 yellowfin tuna were tagged and released on these cruises. It is hoped that future recaptures of these fish will provide concrete evidence of their migrations and growth rate, as has recently happened with skipjack, albacore, and bigeye tuna tagged in the central Pacific area by FWS scientists.

Visual scouting showed heavy concentrations of tuna schools at the surface at Kingman Reef and Palmyra Island. About one-third of these schools were composed of small skipjack (aku) weighing 2 to 15 pounds and three mixed schools of yellowfin and skipjack were sighted. Scouting for tuna schools with the sonic fishfinder had to be given up early in the cruise because of a breakdown of the complex electronic device, but the images of several skipjack schools were recorded and will be studied.

JAPANESE TUNA FISHERY IN INDIAN OCEAN

The tuna fishing in the Western Indian Ocean, developed by Japanese long-line fishermen, is yielding catches of 12-14 yellowfin per 100 hooks. This is a much higher catch rate than on any other grounds fished by the long liners.

The Nankai Regional Fishery Research Laboratory, the Japanese government agency most active in tuna research, is planning to investigate oceanography and tuna ecology on the long-line grounds of the Indian Ocean. The expedition, being made in cooperation with the fisheries department of the University of Kagoshima, is using the University's training ship *Ketten Maru* (510 tons). It sailed in January and is scheduled to return about the middle of March.

On December 3, 1955, the No. 2 *Seiju Maru* (750 tons) returned to the port of Shimizu, Japan, with a full load of 425 tons of yellowfin and big-eyed tuna after an 80 day voyage that extended across the Indian Ocean to the vicinity of the African coast. The average day's catch was reported as about 12 tons of yellowfin. It is said that 70% of the catch passed inspection as suitable for export, that the proceeds of the voyage will amount to about US$90,000, and that crew members will receive about US$275 each for the trip.

In addition, the large tuna mothership No. 21 *Kuroshio Maru* (1,85 tons) returned recently from the new fishing grounds in the Arabian Sea region with 1,063 tons of fish, valued at over $160,000. About 70% of the catch was slated to be canned for export. After this trip the *Kuroshio Maru* sailed for the fishing grounds off Somaliland and Madagascar.

Recent Equatorial Tuna Research

Continued from page 11)

We have been discussing fishing nditions in the general vicinity of ıristmas Island; however, the re- urce is not tied to Christmas Island to any other land mass and is, in ct, a fluid resource, moving from ace to place in the equatorial sys- n and apparently concentrating ıere food supplies are greatest. gure 5 shows our results for 1953, otted on a latitudinal axis. When shing is poor at one longitude it ay be very much better either to e east or west.

For instance, examine the Febru- y-April curve. Fishing was very ɔor in the vicinity of 180° and ther poor around 150° W., the gen- al longitude near Christmas Island. owever, at this same time quite ɔod fishing was found on 140° W., me 600 miles to the east.

Here again, this same set of obser- ations seems susceptible to the tem- erature analysis we discussed above, r, at the time that the surveys were ade, the water was considerably armer at 140° W. than at 150° W. his is reasonable proof of our theo- ries because, usually, the water is cooler at 140° W. than at 150° W. During the period of this survey the trend was reversed and the warmer water was found to the east and, sure enough, the yellowfin tuna were also found to the east.

Our program in the equatorial area should be continued in the future, for American industry will probably expand in this direction when the economic situation is more favorable than at the present time. We could aid this expansion by two service projects; first, development work to mechanize the longline gear so that it will be a more economical tool in the hands of Americans, and second, electro-sonic fish detection so that we may learn more about the distribution of the tuna and perhaps pinpoint their location. If this could be done it could make it unnecessary to set the longline gear blind.

Over and above this, our "routine" survey program is drawing to a close and our seagoing effort in this area will be restricted to special cruises designed to test the hypotheses, or theories, which have been discussed above. One of the special projects involves following a given body of water as it moves north and west away from the Equator and actually measuring the changes in the nutrient salts, the plankton, the forage fish, and the tuna as the water warms up and passes through the cycle we have described above.

Another program, as yet in the planning stage, is a simultaneous oceanographic survey of the entire equatorial region. This will involve a number of vessels—American, Japanese, and possibly French—and will be designed to cover the equatorial Pacific from the eastern end, where the American fishery exists, to the Philippines. This multiple ship cruise will give invaluable insight into the circulation as a whole and will also serve to tie together the many less extensive surveys that have been conducted in the past, both by POFI and by other agencies operating to the east. ★

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ALTHOUGH 1955 was not everything desired by most fishery interests, things are looking up for the future. Some of our most troublesome problems are being recognized and helpful solutions searched out — by both business and government authorities.

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